Additional Assessment Materials
Summer 2021

Pearson Edexcel

GCSE (9-1) in Mathematics 1MA1
Higher (Calculator) (Public release version)

Topic 2: Algebra (Test 2)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an optional part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

Subject Specific Guidance

This booklet contains questions on the topic given on the front cover.

The questions in the question paper were designed to last around 45-60 minutes.

This topic test is part of a suite of 10 topic tests. As there is some overlap between the topics of number and ratio; these were grouped together and both a non-calculator and calculator assessment produced at each tier level. The topics of probability and statistics go hand-in-hand so these were also grouped together.

Topic	Tier	Calculator/Non-Calculator
Number & Ratio	Foundation	Calculator
Number & Ratio	Foundation	Non-Calculator
Number & Ratio	Higher	Calculator
Number & Ratio	Higher	Non-Calculator
Algebra	Foundation	Calculator
Algebra	Higher	Calculator
Probability & Statistics	Foundation	Calculator
Probability & Statistics	Higher	Calculator
Geometry	Foundation	Calculator
Geometry	Higher	Calculator

1 (*a*) Simplify $m^3 \times m^4$

$m^{3+4} = m^7$

m^7

.....

(1)

(*b*) Simplify $\dfrac{32q^9r^4}{4q^3r}$

$\frac{32}{4} = 8$ $\quad \frac{q^9 r^4}{q^3 r} = q^6 r^3$ $\quad 8q^6r^3$

$8q^6r^3$

.....

(2)

(Total for Question 1 is 3 marks)

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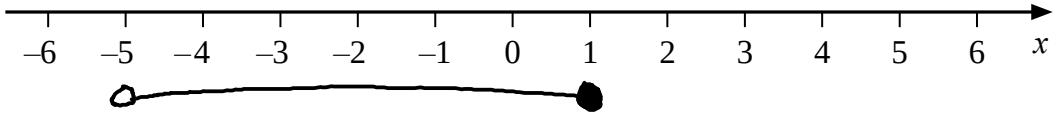
2 On the number line below, show the set of values of x for which $-2 < x + 3 \leqslant 4$

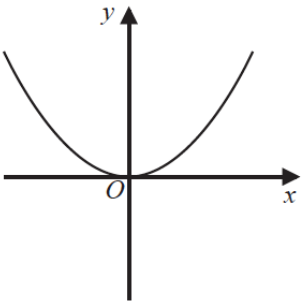
$-2 < x+3 \rightarrow -5 < x$ $\quad x+3 \leq 4 \rightarrow x \leq 1$



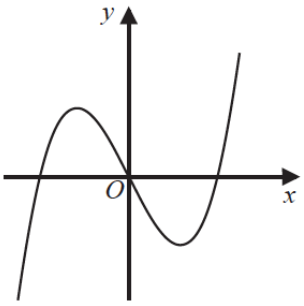
(Total for Question 2 is 3 marks)

3 Here are six graphs.

A



B



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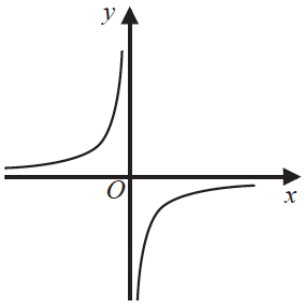

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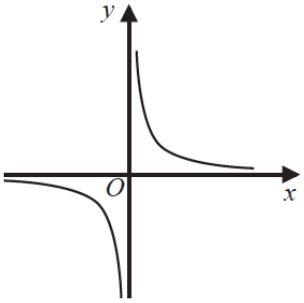

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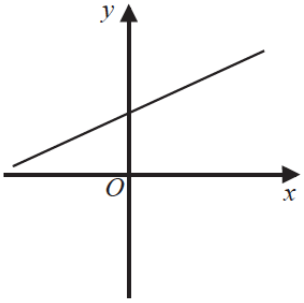
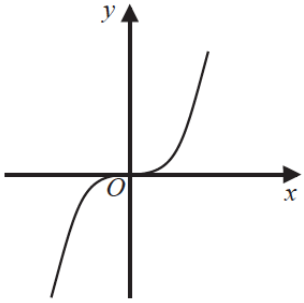


F



Write down the letter of the graph that could have the equation

(*a*) $y = x^3$

F

(1)

(*b*) $y = \frac{1}{x}$

D

(1)

(Total for Question 3 is 2 marks)

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4 The first five terms of an arithmetic sequence are

1 4 7 10 13

Write down an expression, in terms of n, for the nth term of this sequence.

goes up in 3 so 3n → 3n − 2
number before 1 is −2

3n − 2

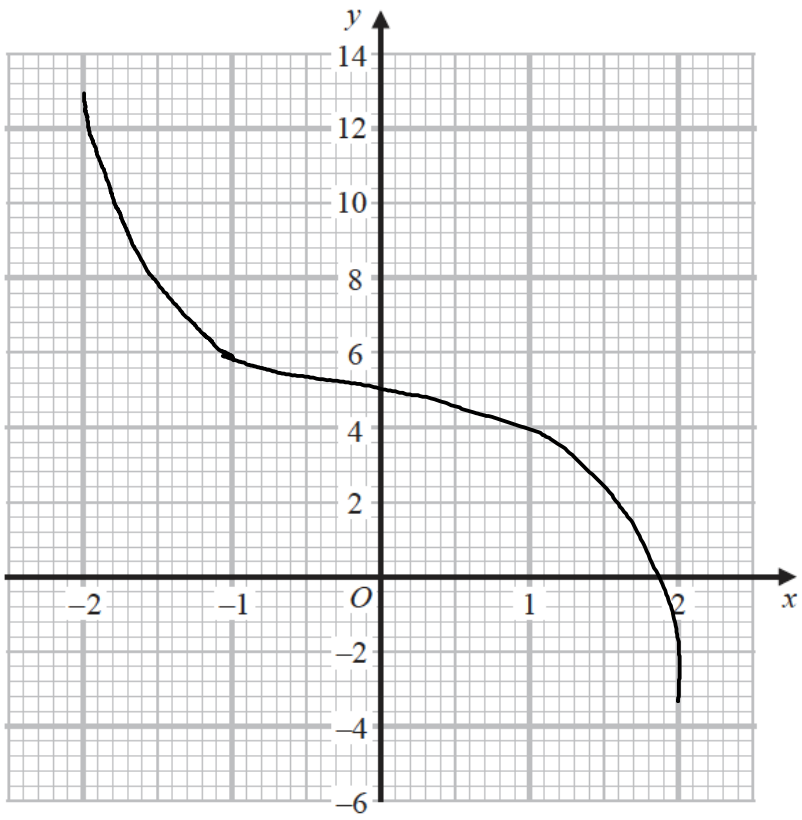
(Total for Question 4 is 2 marks)

5 (*a*) Complete the table of values for $y = 5 - x^3$

x	–2	–1	0	1	2
y	13	6	5	4	-3

(2)

(*b*) On the grid below, draw the graph of $y = 5 - x^3$ for values of x from –2 to 2



(2)

(Total for Question 5 is 4 marks)

6 Solve $5x^2 - 4x - 3 = 0$

Give your solutions correct to 3 significant figures.

$5x^2 - 4x - 3 = 0$

$a = 5 \quad b = -4 \quad c = -3$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\frac{(-4) \pm \sqrt{16 - -60}}{10} \rightarrow \frac{-(-4) \pm \sqrt{76}}{10}$

$x = \frac{2 - \sqrt{19}}{5} = 0.472 \qquad x = \frac{2 + \sqrt{19}}{5} = 1.27$

0.472 and 1.27

(Total for Question 6 is 3 marks)

7 Make v the subject of the formula $w = \frac{15(t - 2v)}{v}$

$wv = 15(t - 2v) \rightarrow wv = 15t - 30v$

$15t = wv + 30v \rightarrow 15t = v(w + 30)$

$\frac{15t}{w + 30} = v \qquad v = \frac{15t}{w + 30}$

(Total for Question 7 is 3 marks)

8 The straight line L_1 has equation $y = 3x - 4$

The straight line L_2 is perpendicular to L_1 and passes through the point (9, 5)

Find an equation of line L_2

L_1 gradient $= \frac{3}{1}$ perpendicular gradient invert and minus so L_2 gradient $= -\frac{1}{3}$

$y = -1/3x + c$ sub in (9, 5)

$5 = -1/3(9) + c$

$5 = -3 + c$

$c = 8$

$y = -1/3x + 8$

$y = -1/3x + 8$

(Total for Question 8 is 3 marks)

9 Solve $\frac{3x-2}{4}-\frac{2x+5}{3}=\frac{1-x}{6}$

common denominator is 12

so $3(3x-2)-4(2x+5)=2(1-x)$

$9x-6-8x-20=2-2x \rightarrow x-26=2-2x$

$3x=28 \rightarrow x=\frac{28}{3}$

$x = \frac{28}{3}$

(Total for Question 9 is 4 marks)

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10 Expand and simplify $(x-2)(2x+3)(x+1)$

$(x-2)(2x+3) \rightarrow 2x^2+3x-4x-6$

$= 2x^2-x-6$

$(2x^2-x-6)(x+1) \rightarrow 2x^3+2x^2-x^2-x-6x-6$

$= 2x^3+x^2-7x-6$

$2x^3 + x^2 - 7x - 6$

.....

(Total for Question 10 is 3 marks)

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11 (*a*) Show that the equation $x^3 + x = 7$ can be rearranged to give $x = \sqrt[3]{7 - x}$

$x^3 + x = 7 \rightarrow x^3 = 7 - x \rightarrow x = \sqrt[3]{7-x}$

(1)

(*b*) Starting with $x_0 = 2$,
use the iteration formula $x_{n+1} = \sqrt[3]{7 - x_n}$ three times to find an estimate for a solution of $x^3 + x = 7$

$x_0 = 2$
$x_1 = 1.709975947$
$x_2 = 1.742418802$
$x_3 = 1.738849506$

1.738849506

.....

(3)

(Total for Question 11 is 4 marks)

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12 For all values of x

$$f(x) = (x + 1)^2 \quad \text{and} \quad g(x) = 2(x - 1)$$

Show that $gf(x) = 2x(x + 2)$

sub f into g $\rightarrow$ $2[(x+1)^2 - 1]$

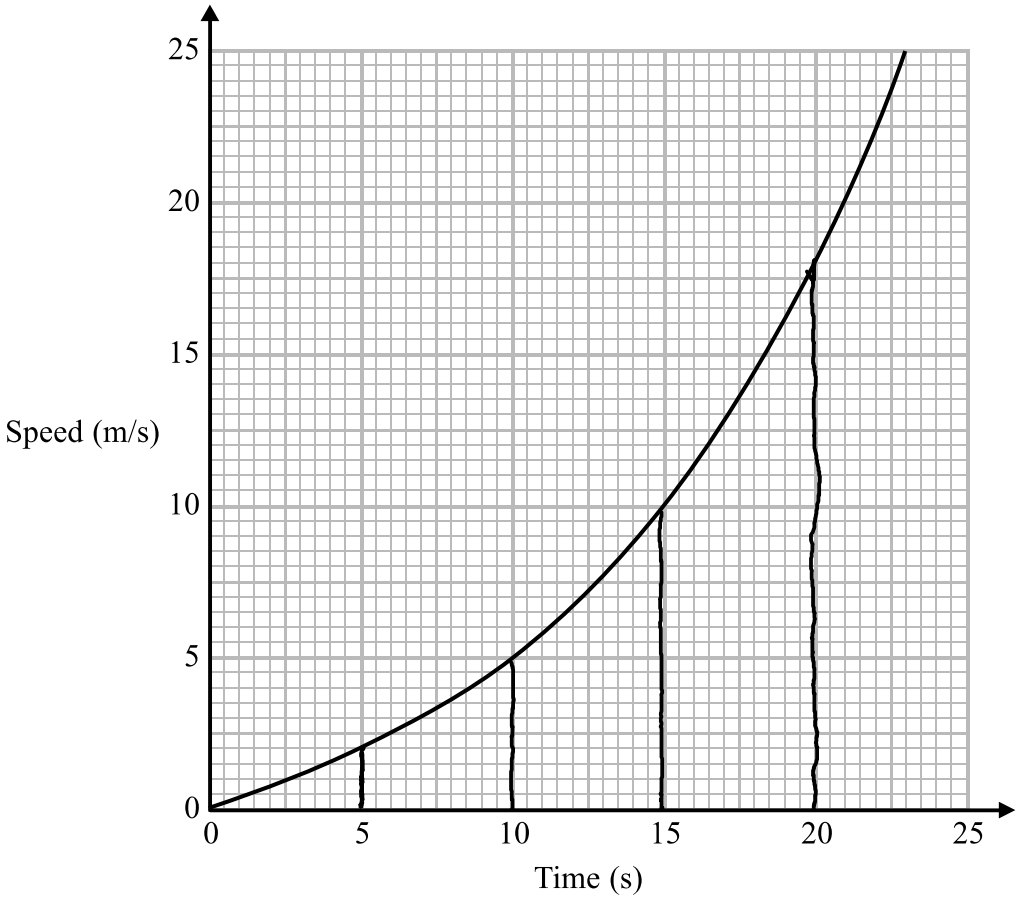
$(x+1)(x+1) = x^2 + 2x + 1$

$2[x^2 + 2x + 1 - 1]$

$2[x^2 + 2x] \rightarrow 2x(x+2)$

(Total for Question 12 is 2 marks)

13 Here is a speed-time graph for a train.



Work out an estimate for the distance the train travelled in the first 20 seconds.
Use 4 strips of equal width.

$\frac{20}{4} = 5 \rightarrow$ so strips of 5 seconds each.

$\frac{1}{2}(0+2)5 + \frac{1}{2}(2+5)5 + \frac{1}{2}(5+10)5 + \frac{1}{2}(10+18)5$

$= 105$ metres

105 ..... m

(Total for Question 13 is 3 marks)

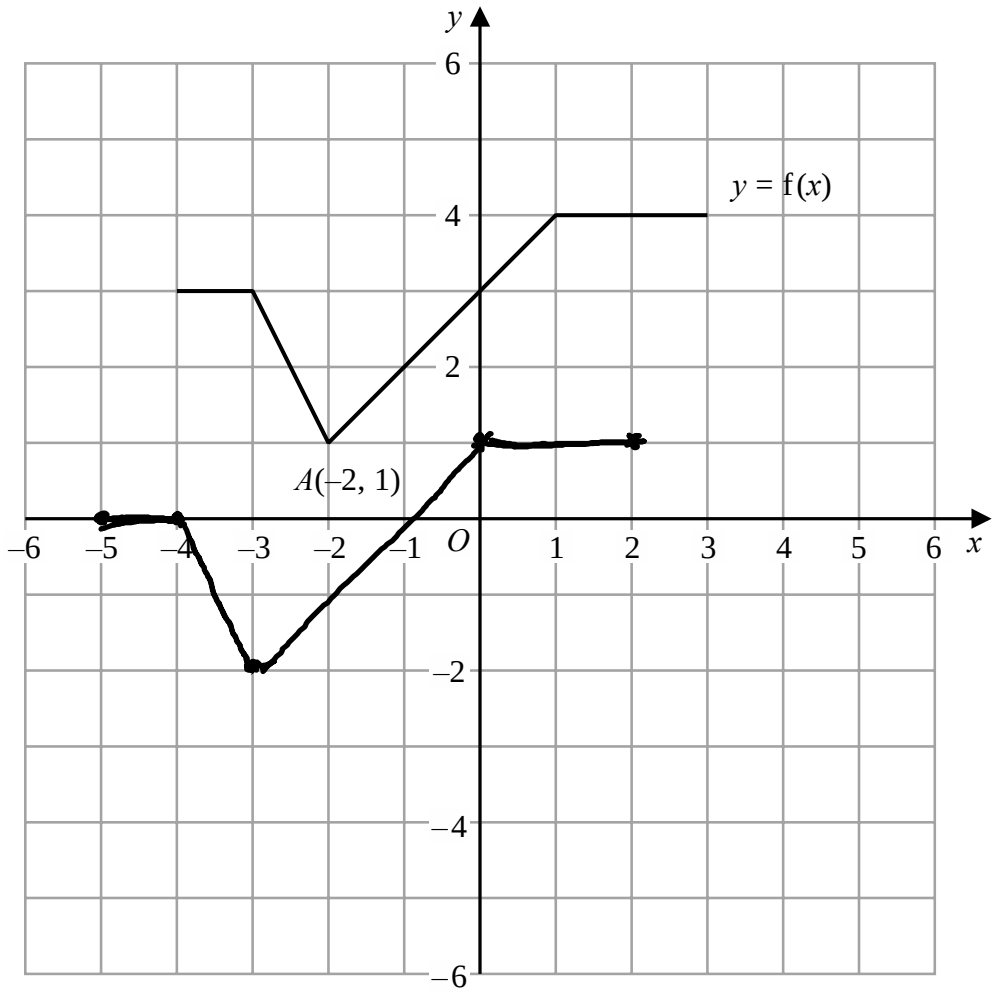
14 Show that $\frac{7x - 14}{x^2 + 4x - 12} \times \frac{x - 6}{x^3 - 36x}$ simplifies to ax where a is an integer.

$\frac{7x-14}{x^2+4x-12} \times \frac{x^3-36x}{x-6} \rightarrow \frac{7x^4-252x^2-14x^3+504x}{x^3-6x^2+4x^2-24x-12x+72}$

$\rightarrow \frac{7x(x^3-2x^2-36x+72)}{x^3-2x^2-36x+72} \rightarrow \frac{7x}{1} = 7x \quad a=7$

(Total for Question 14 is 4 marks)

15 The graph of $y = f(x)$ is shown on the grid.



On the grid, draw the graph with equation $y = f(x + 1) - 3$

(Total for Question 15 is 2 marks)

Transformation $\begin{pmatrix} -1 \\ -3 \end{pmatrix}$ left 1 down 3 each point

16 Solve algebraically the simultaneous equations

$$2x^2 - y^2 = 17$$
$$x + 2y = 1$$

$x + 2y = 1 \rightarrow x = 1 - 2y$

$2(1-2y)^2 - y^2 = 17$

$2(1-4y+4y^2) - y^2 = 17$

$2 - 8y + 8y^2 - y^2 = 17$

$2 + 7y^2 - 8y = 17$

$7y^2 - 8y - 15 = 0$

$7y^2 + 7y - 15y - 15 = 0$

$7y(y+1) - 15(y+1) = 0$

$y = -1 \quad y = 15/7$

$(1-2y)^2$

$(1-2y)(1-2y)$

$1 - 4y + 4y^2$

$y = -1 \quad x = 1 - 2(-1) = 3$

$(3, -1)$

$y = 15/7 \quad x = 1 - 2(15/7) = -\frac{23}{7}$

$\left(-\frac{23}{7}, 15/7\right)$

(Total for Question 16 is 5 marks)

TOTAL FOR PAPER IS 50 MARKS